



Off-job Assessment

Demonstrate and apply knowledge of cable coding, colours, characters, applications, and capacity (level 4, credits 2) Question 10,11 and 12

Trainee Name: (First/Last)

Company/Employer:

National Student Number (NSN):
(if known)

Skills Number:

Phone Number:

Email:

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Introduction

In this assessment

This is a theory assessment.

The Unit Standard is for people engaged in the manufacture of electric switchboards and covers knowledge of electric switchboard circuits.

Please answer all the questions. Write your answers clearly in pen, not pencil.

Please note: each question has a cross reference to the appropriate Unit Standard evidence requirement (ER). A copy of the Unit Standard can be found on the NZQA website, if required <http://nzqa.govt.nz/> .

Legislation and Safety

It is very important for your own safety and the safety of colleagues and customers that you follow safe and sound practice when completing electrical work. Safe and sound practice relating to the installation of electrical equipment is defined in AS/NZS: 3000:2007, Electrical Installations (known as the Australian/New Zealand Wiring Rules).

You may refer to current legislation and Standards (such as AS/NZS: 3000:2007) during assessment.

All activities and evidence presented must comply with legislation, policies and procedures, ethical codes, Standards (such as those listed in Schedule 2 of the Electricity (Safety) Regulations 2010), site/industry practice, and any manufacturer's instructions, specification and data sheets.

Assessor/Tutor sign-off

You should give this assessment to your assessor / tutor to be marked.

Your assessor may discuss the outcome of this assessment with you. As with all Unit Standard assessments, you need to prove that are competent in all parts of the Unit Standard. Therefore, you need to answer all the questions correctly.

Your assessor / tutor will advise you if you have answered incorrectly or need to provide more evidence to prove your competence. This may be done verbally. Your assessor / tutor should make notes of any discussions you have regarding this assessment.

Pre-assessment form

Please complete the following, before starting the assessment.

I have completed/produced the following	Yes	No
I understand what is required to achieve competency in this assessment.	<input type="checkbox"/>	<input type="checkbox"/>
I understand what I need to do to submit my assessment material when I have completed it.	<input type="checkbox"/>	<input type="checkbox"/>
I have the knowledge to complete each question.	<input type="checkbox"/>	<input type="checkbox"/>
I understand how I will get my results.	<input type="checkbox"/>	<input type="checkbox"/>
I understand how the appeals process works.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that my results will be reported to NZQA.	<input type="checkbox"/>	<input type="checkbox"/>
I have informed my assessor about any special needs that need to be accommodated.	<input type="checkbox"/>	<input type="checkbox"/>

Refer to AS/NZS 3000 and AS/NZS 3008 1.2 to answer the following questions

Question 10

Scenario:

A **three-phase, 4 core, 400V, copper, mains cable** is being installed in a large new farm complex electrical installation comprising 3 large houses, a large milking shed and associated out-buildings.

The customer is to be provided with the best solution that meets the technical requirements.

Use the following information and information from the tables provided below for the calculations.

- Installation Route: 60m length between the point of supply and the main switchboard
- Installation Method: Buried direct
- Maximum Demand: 60kW balanced over the three phases
- Voltage Drop: Maximum permitted voltage drop is 1.5%
- Growth Allowance: An allowance of 20% for load growth
- Environment: The ambient soil temperature is 10oC
- Conductor Supplier Information: Conductor temperature of 75oC
- Indicate the correct answer for each section. Show workings where applicable.

- a) Calculate the maximum demand current of the installation before the allowance for growth. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 76.6A	<input type="checkbox"/> 86.6A	<input type="checkbox"/> 96.6A	<input type="checkbox"/> 106.6A
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- b) Calculate the current demand after the allowance for load growth required. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 83.92A	<input type="checkbox"/> 93.92A	<input type="checkbox"/> 103.92A	<input type="checkbox"/> 113.92A
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- c) What is the minimum size cable that would satisfy this current demand?

<input type="checkbox"/> 6mm ²	<input type="checkbox"/> 10mm ²	<input type="checkbox"/> 16mm ²	<input type="checkbox"/> 50mm ²
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- d) Which table did you use to find the cable capable of carrying the current demand?

<input type="checkbox"/> Table 10	<input type="checkbox"/> Table 12	<input type="checkbox"/> Table 13	<input type="checkbox"/> Table 27
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- e) What is the current rating of the cable selected from the table identified in the previous question?

<input type="checkbox"/> 96A	<input type="checkbox"/> 106A	<input type="checkbox"/> 116A	<input type="checkbox"/> 126A
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- f) What is the value of de-rating factor for the ambient temperature?

<input type="checkbox"/> 0.94	<input type="checkbox"/> 1.04	<input type="checkbox"/> 1.14	<input type="checkbox"/> 1.24
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- g) Which table did you use to find the de-rating factor for the ambient temperature?

<input type="checkbox"/> Table 10	<input type="checkbox"/> Table 12	<input type="checkbox"/> Table 13	<input type="checkbox"/> Table 27(2)
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- h) Calculate the maximum load that can be carried by the cable chosen after applying the de-rating factor? Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 90.25A	<input type="checkbox"/> 100.25A	<input type="checkbox"/> 110.25A	<input type="checkbox"/> 120.25A
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- i) Is the cable selected for part c above still adequate for current carrying capacity?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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- j) Calculate and identify below, the maximum volt drop permitted. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 3V	<input type="checkbox"/> 4V	<input type="checkbox"/> 5V	<input type="checkbox"/> 6V
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- k) Calculate and identify the minimum size of conductor that would satisfy this permitted volt drop. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 6mm ²	<input type="checkbox"/> 10mm ²	<input type="checkbox"/> 16mm ²	<input type="checkbox"/> 50mm ²
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- l) Which table did you use to determine volt drop?

<input type="checkbox"/> Table 10	<input type="checkbox"/> Table 12	<input type="checkbox"/> Table 42	<input type="checkbox"/> Table 27(2)
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- m) What minimum size of cable would satisfy both the current carrying capacity and volt drop requirements?

<input type="checkbox"/> 6mm ²	<input type="checkbox"/> 10mm ²	<input type="checkbox"/> 16mm ²	<input type="checkbox"/> 50mm ²
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(ER 2.1, 2.2, 2.3, 3.1)

Question 11

Scenario:

A three-phase 400V oven is to be installed in a restaurant. The electrician has calculated in accordance with Part 2 of AS/NZS 3000, that the minimum size cable that will meet all requirements is a 4mm², 4 core, TPS copper cable.

You have to confirm, or otherwise, using calculations that the 4mm², 3 core and earth TPS copper cable is the minimum size cable that meets the load and voltage drop requirements.

- Installation Route: 20m length
- Installation Method: Fixed directly (touching)
- Maximum Demand: 22kW
- Voltage Drop: Maximum permitted voltage drop is 1.5% from the switchboard to the oven
- Environment: The ambient air temperature is 20°C
- Conductor Supplier Information: Conductor temperature of 75°C

- a) Calculate the maximum demand current of the installation before the allowance for growth. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 26.08A	<input type="checkbox"/> 31.76A	<input type="checkbox"/> 46.08A	<input type="checkbox"/> 56.08A
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- b) What size of cable would satisfy this current demand before applying rating factor?

<input type="checkbox"/> 1.5mm ²	<input type="checkbox"/> 2.5mm ²	<input type="checkbox"/> 4mm ²	<input type="checkbox"/> 6mm ²
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- c) Which table did you use to find the cable capable of carrying the current demand?

<input type="checkbox"/> Table 10	<input type="checkbox"/> Table 12	<input type="checkbox"/> Table 13	<input type="checkbox"/> Table 27(2)
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d) What is the current rating of the cable selected from the table identified in the previous question?

<input type="checkbox"/> 23A	<input type="checkbox"/> 33A	<input type="checkbox"/> 43A	<input type="checkbox"/> 53A
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e) What is the value of rating factor for the ambient temperature?

<input type="checkbox"/> 0.92	<input type="checkbox"/> 1.12	<input type="checkbox"/> 1.24	<input type="checkbox"/> 1.34
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f) Which table did you use to find the de-rating factor for the ambient temperature?

<input type="checkbox"/> Table 10	<input type="checkbox"/> Table 12	<input type="checkbox"/> Table 13	<input type="checkbox"/> Table 27(1)
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g) Calculate the maximum load that can be carried by the cable chosen after applying the de-rating factor. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 26.26A	<input type="checkbox"/> 30.25A	<input type="checkbox"/> 36.96A	<input type="checkbox"/> 45.25A
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h) What size of cable would satisfy this current demand after applying the rating factor?

<input type="checkbox"/> 1.5mm ²	<input type="checkbox"/> 2.5mm ²	<input type="checkbox"/> 4mm ²	<input type="checkbox"/> 6mm ²
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i) Calculate and identify below, the maximum volt drop permitted. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> 3V	<input type="checkbox"/> 4V	<input type="checkbox"/> 5V	<input type="checkbox"/> 6V
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- j) Determine, and identify below, if the cable selected for question 9h meets the volt drop requirements. Show your workings in the box below, and then select the correct answer.

<input type="checkbox"/> Yes it does	<input type="checkbox"/> No it doesn't
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(ER 2.1; 2.2; 2.3 and 3.1)

Question 12

From the three combinations of installation routes and rating factors below, select the combination that would allow the smallest (and therefore the cheapest) cable. State the minimum size of cable required for each, taking into account current carrying capacity and voltage drop. The load current for all combinations is 42A.

The cable to be used for all combinations is a Two-Core Sheathed, 75°C thermoplastic cable.

There is no temperature rating to take into account.

The maximum volt drop allowable is 5.75V.

Show all your working in the table below.

Hint: Use Tables 10 and 42 from AS/NZS3008.

Combination	Show your working
<p>Combination 1</p> <p>The cable run is only 10m but it has to be partially surrounded by thermal insulation, unenclosed.</p>	
<p>Combination 2</p> <p>The second option is buried direct, but the cable run would be 30m.</p>	
<p>Combination 3</p> <p>20m route along a wall with the cable unenclosed and touching the wall (not exposed to sun)</p>	

The cable that will allow the smallest cable to be used would be:

- Situation 1
- Situation 2
- Situation 3

(ER 2.4)

Trainee sign off

Sign before giving this assessment and evidence to your assessor

Trainee name:	Skills Trainee Number:
	NSN (if known):

Declaration:

I have answered all questions.

I confirm that this assessment is my own work.

I understand that there is an appeals process if I am not happy with the assessment decision.

Signature:

Date:

Assessor's feedback to trainee

I confirm that the trainee has completed this assessment. The work shows a level of competence that is appropriate for the unit standard.

Assessor name:

Assessor number:

Signature:

Date:

Email:

skills.

The Skills Organisation

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